M8.07.0 Steel Beam Highway Guard.

The materials for this work shall conform to the following requirements:

A. Fabrication.

All steel components and hardware shall be galvanized. Posts shall be made of steel unless wood is specified. All metal work shall be done in the shop. No punching, cutting or welding shall be done in the field. Holes for special details in exceptional cases may be made in the field when approved by the Engineer but such holes shall be drilled. Field punching may be permitted, if approved by the Engineer, after it has been demonstrated that such punching will not result in damage to the surrounding metal. Fabrication shall include all operations such as shearing, cutting, punching, forming, drilling, milling, bending, welding and riveting. Components of bolted assemblies shall be galvanized separately before assembly. When it is necessary to straighten any sections after galvanizing, such work shall be performed without damage to the zinc coating.

Galvanized surfaces that are abraded or damaged at any time after application of the zinc coating shall be repaired by thoroughly wire brushing the damaged areas and removing all loose and cracked coating after which the cleaned areas shall be painted with two (2) coats of paint, high zinc dust content, conforming to the requirements of M7.04.11.

B. Posts.

1. Steel Posts.

Steel posts and channel members for anchor posts shall be fabricated from new structural steel sections conforming to the dimensions and design shown on the plans. All posts, including end anchor posts, and anchor posts for use at drives, shall be steel "H" sections.

All holes drilled in the galvanized post sections shall be cleaned and painted, before bolts are installed, with two coats of paint, high zinc dust content, conforming to M7.04.11.

Structural steel shall conform to the requirements of AASHTO M 183, except that copper bearing steel will not be required. Galvanizing shall meet the requirements of AASHTO M 111. Each member shall be stamped with AASHTO designation and the grams of galvanizing per square meter of surface area.

Posts may be of the conventional Hot Rolled Structural Shape or of the Welded Type as approved by the Department.

2. Wood Posts.

The posts shall be rough sawn (unplaned) with nominal dimensions as indicated on the plans and with tolerances of 25 millimeters in length and 6 millimeters in width and thickness. All holes in the posts shall be drilled prior to application of the preservative. The stress grade shall be 6.9 megaPascals or more in extreme fiber bending.

Testing for Stress Grade shall be in accordance with the Northeastern Lumber Manufacturers Association Inc., Northern Hardwood and Pine Manufacturers Association, Inc., Southern Pipe Inspection Bureau, West Coast Lumber Inspection Bureau, or the Western Wood Products Association, Standard Grading Rules. If another Timber Association is proposed, it must receive the approval of the Department before it will be considered or accepted.

Prior to treatment, all Posts shall be seasoned, conditioned and completely machined in accordance with AWPA Standard M1.

Posts shall be treated with either chromated copper arsenate (CCA) or ammoniacal copper arsenate (ACA). Treatment shall be full length under pressure by the empty-cell or full-cell process in accordance with AWPA Standards C1 and C4. The preservatives, minimum retention thereof and applicable AWPA standards are listed in the following table:

Preservative	Retention kg/m^3 of Post	AWPA Standards
ACA	9.6	P5
CCA, Type A	9.6	P5
CCA, Type B	9.6	P5
CCA, Type C	9.6	P5

When water borne preservatives are used, temperature requirements, as stipulated in Section 2.221 of AWPA Standard C1, shall be closely regulated. Species of wood that are difficult to penetrate shall be incised

in accordance with Section 2.2 of AWPA Standard C6. No unnecessary cutting of treated posts will be allowed after treatment. All posts and blocks with surfaces damaged by cutting, drilling or any other cause shall be field treated with a hot preservative solution in accordance with AWPA Standard M4. Preservatives used for this purpose shall be the same as those used for the basic treatment and shall conform to the same specifications.

Certificates of compliance and certificates of inspection for each lot of Wood Posts must be presented before any Posts are installed. The certificates bearing the approved inspection agencies verification must specify the species.

The certificates of inspection and compliance do not signify mandatory acceptance of the entire lot. The Engineer still has the option of rejecting Posts (included in any particular lot) that he/she may consider sub-standard because of unsound knots and shakes, excessive checking or other defects that may be detrimental to the structural integrity of the posts or offset blocks.

The fabricator shall retain a Department approved Agency to inspect and certify the treated Posts and Blocks in accordance with these specifications and AWPA Standard M2.

All treated Posts shall be marked in accordance with AWPA Standards M1 and M6. (The mark is to include the identifying lot number). The Post shall also be stamped with the Inspector's identification. The mark is to be placed on an upper side of the Post and located so that it is not obstructed by the offset blocks, rails, or any other appurtenances. The Inspector's stamp shall be legibly hammer-stamped on the head of the post, in accordance with AWP Standard M2 and the above.

C. Offset Blocks.

The blocks shall be of the same type throughout the project. Requirements for specific material types are as follows;

1. Wood Offset Blocks.

Wood Offset Blocks shall meet the requirements of B. Posts, 2. Wood Posts. above. When wood offset blocks are used on wood posts, they shall be the same species as the posts.

2. Plastic Offset Blocks.

Plastic Offset Blocks shall be made with a minimum of 80% recycled polyethylene plastic. Ultraviolet (UV) protection shall consist of at least 2.5% carbon black evenly dispersed throughout the block in accordance with ASTM D-1603 or an equivalent form of UV protection. Wood fillers will not be allowed. Each block shall be stamped at the factory with the Manufacturer's Identification and lot number and conform to the dimensions shown on the plans.

D. Rail Element and Terminal Sections.

The steel rail element and terminal sections shall conform to AASHTO M 180, Class A, (base metal thickness 2.7 millimeters), Type 2 with the following additions:

The length of the railing shall be according to the plans and not over 4.127 meters.

Each end of the steel rail for every stretch of guard shall be fitted with a terminal section as shown on the plans. The terminal section shall have the same splice detail as the rail.

The projecting heads of all connection and splice bolts shall be rounded and shallow so that no appreciable projection will obstruct a vehicle sliding along the rail.

Where railing is to be constructed on curves which have a radius of 45 meters or less, the rail elements shall be fabricated to the proper radius with the road side of the rail either concave or convex as required.

E. Bolts, Nuts and Washers.

All bolts, nuts and washers used in assembling and erecting the rail shall conform to the requirements of ASTM A 307 and shall be of the size shown on the plans. They shall be designed to develop the required joint strength. Galvanizing shall be by the hot-dip process to conform to the requirements of AASHTO M 232.